Fig. 1A

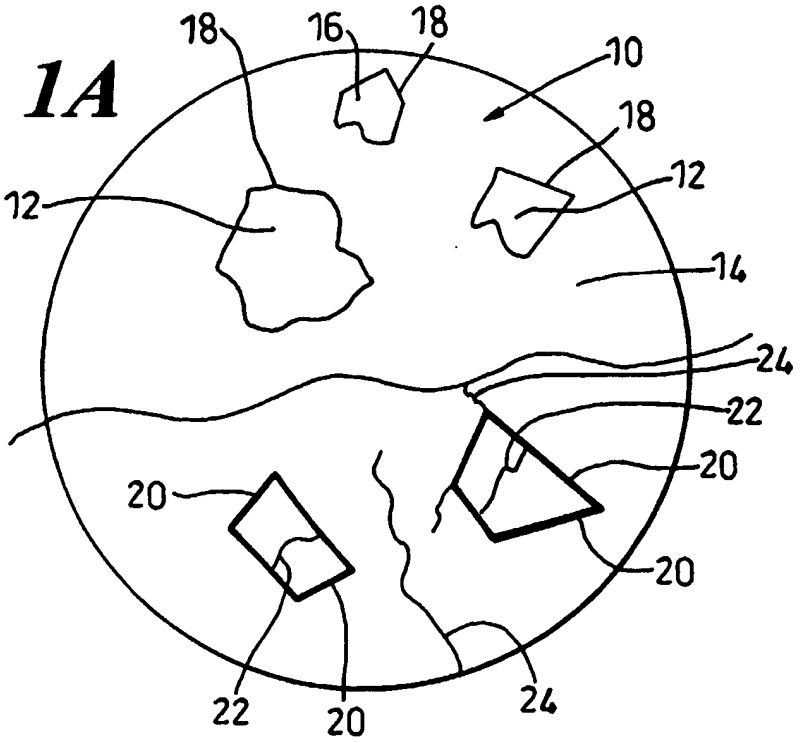


Fig. 1B

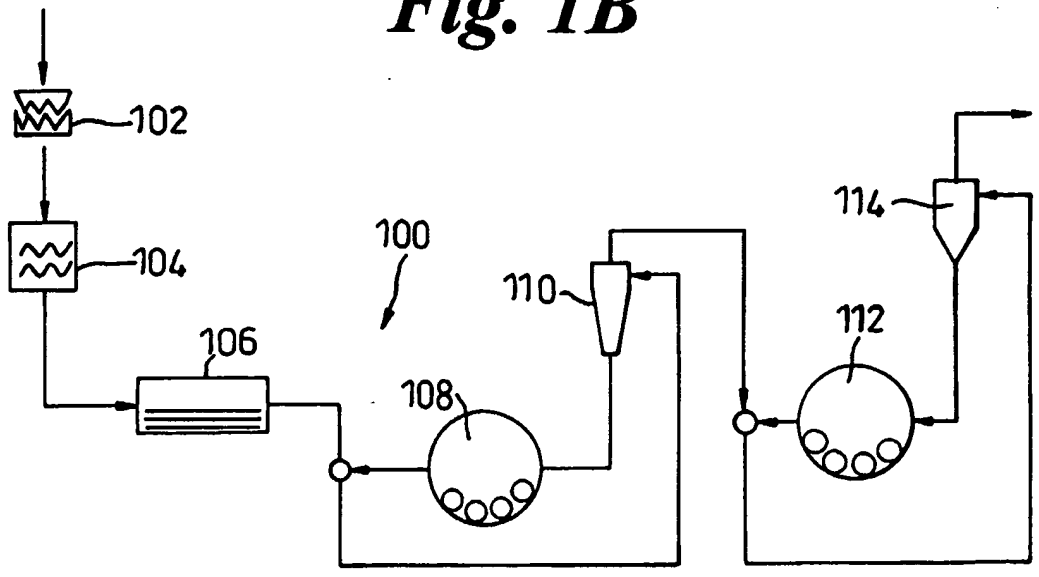


Fig. 2A

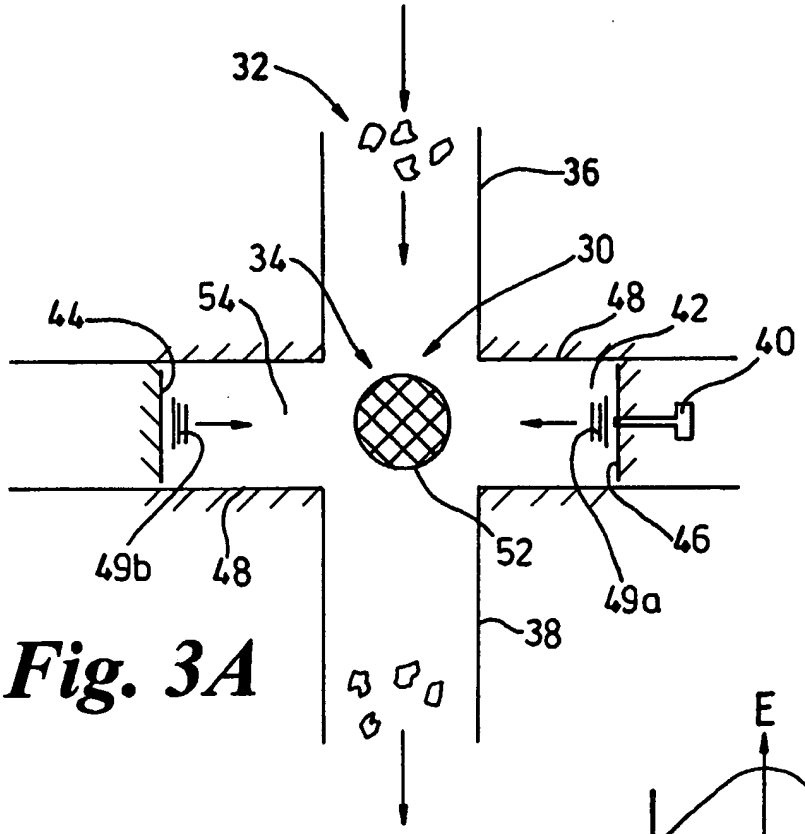


Fig. 3A

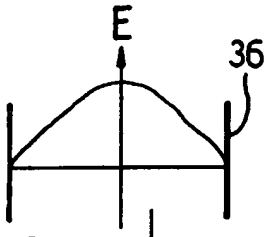


Fig. 3B

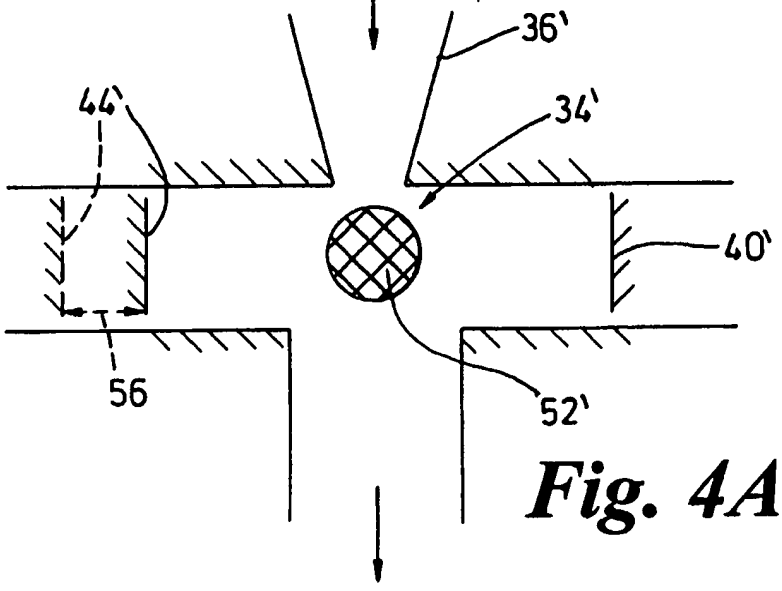


Fig. 4A

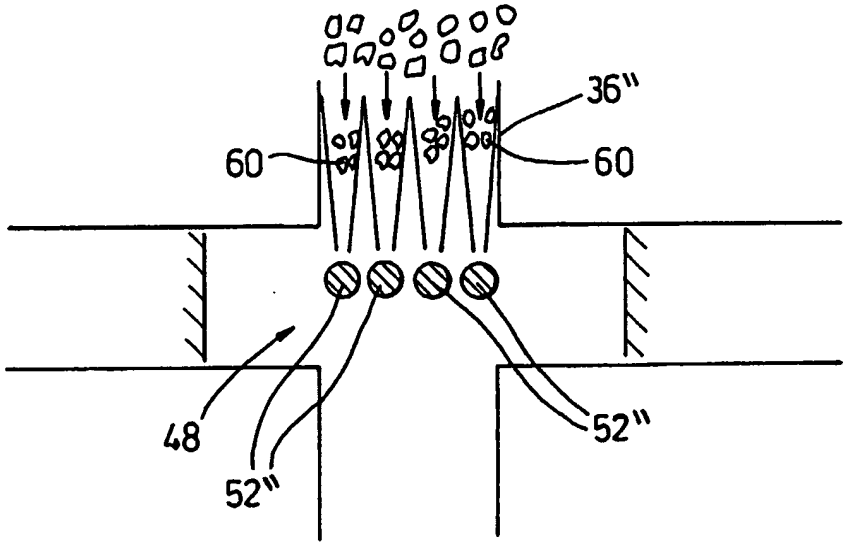
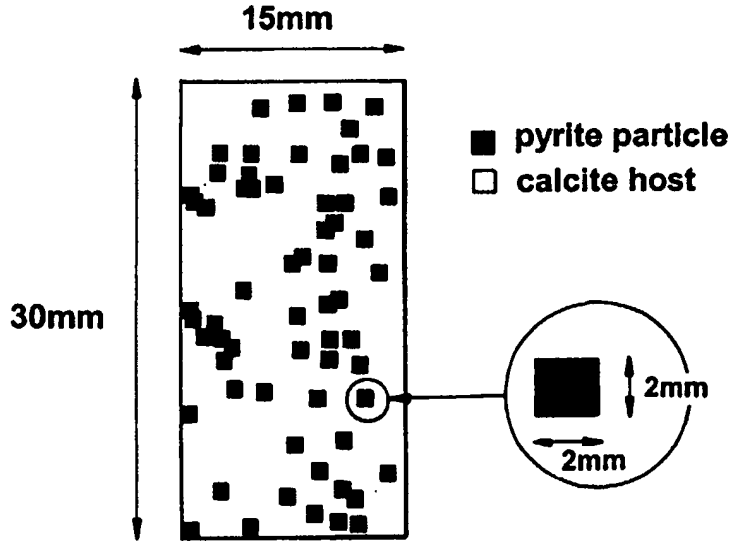
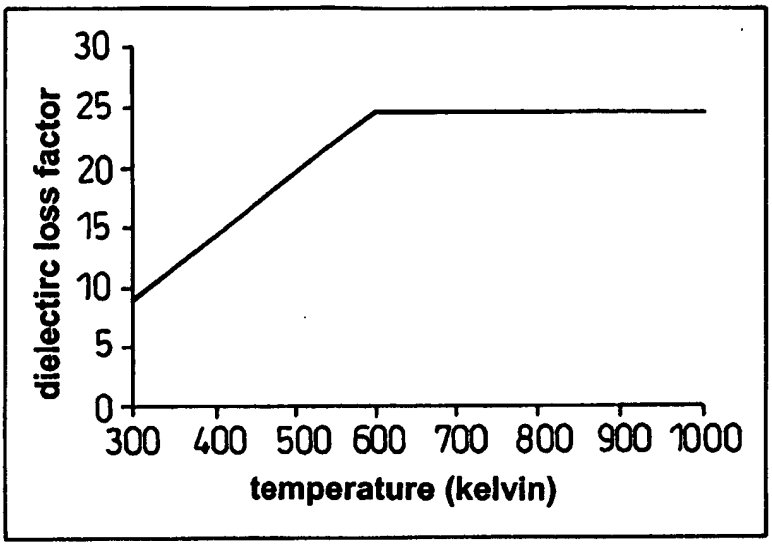


Fig. 4B



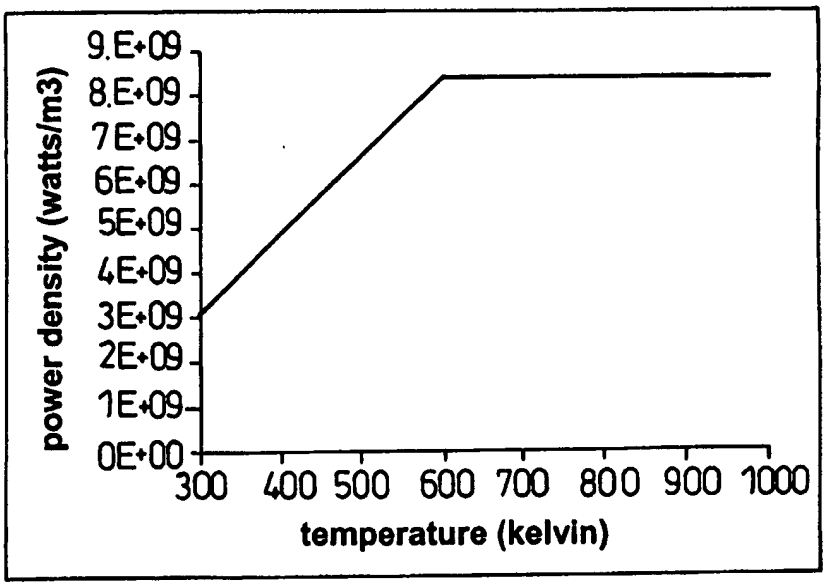
Model of the Calcite and Pyrite Ore Sample

Fig. 5



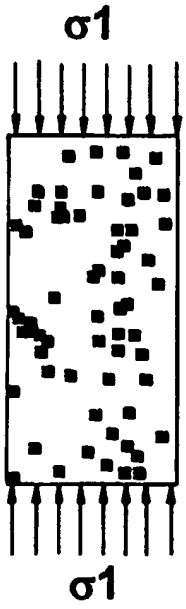
Variation of dielectric loss factor of pyrite as function of temperature

Fig. 6



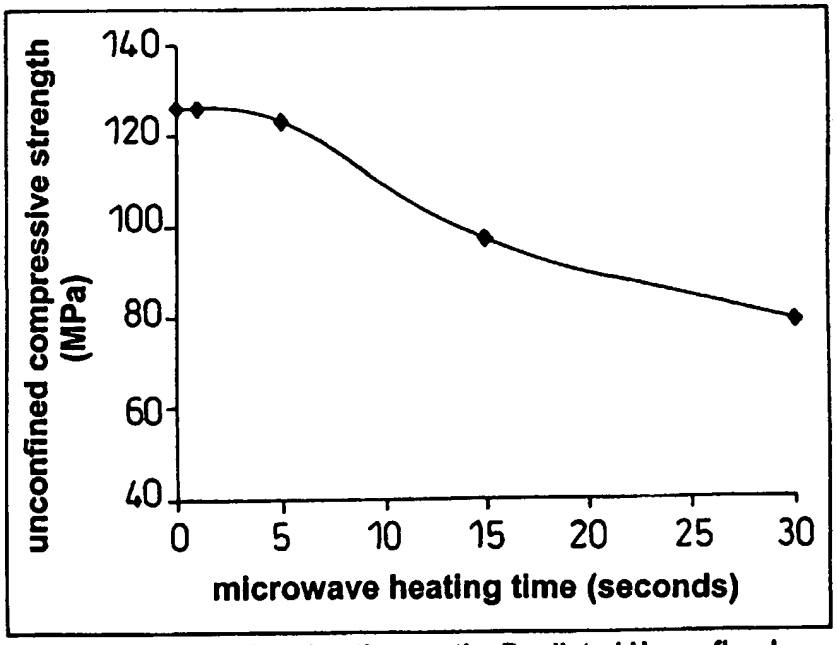
Variation of microwave power density of pyrite in a 2.6kW 2.45 GHz Cavity as a function of temperature

Fig. 7



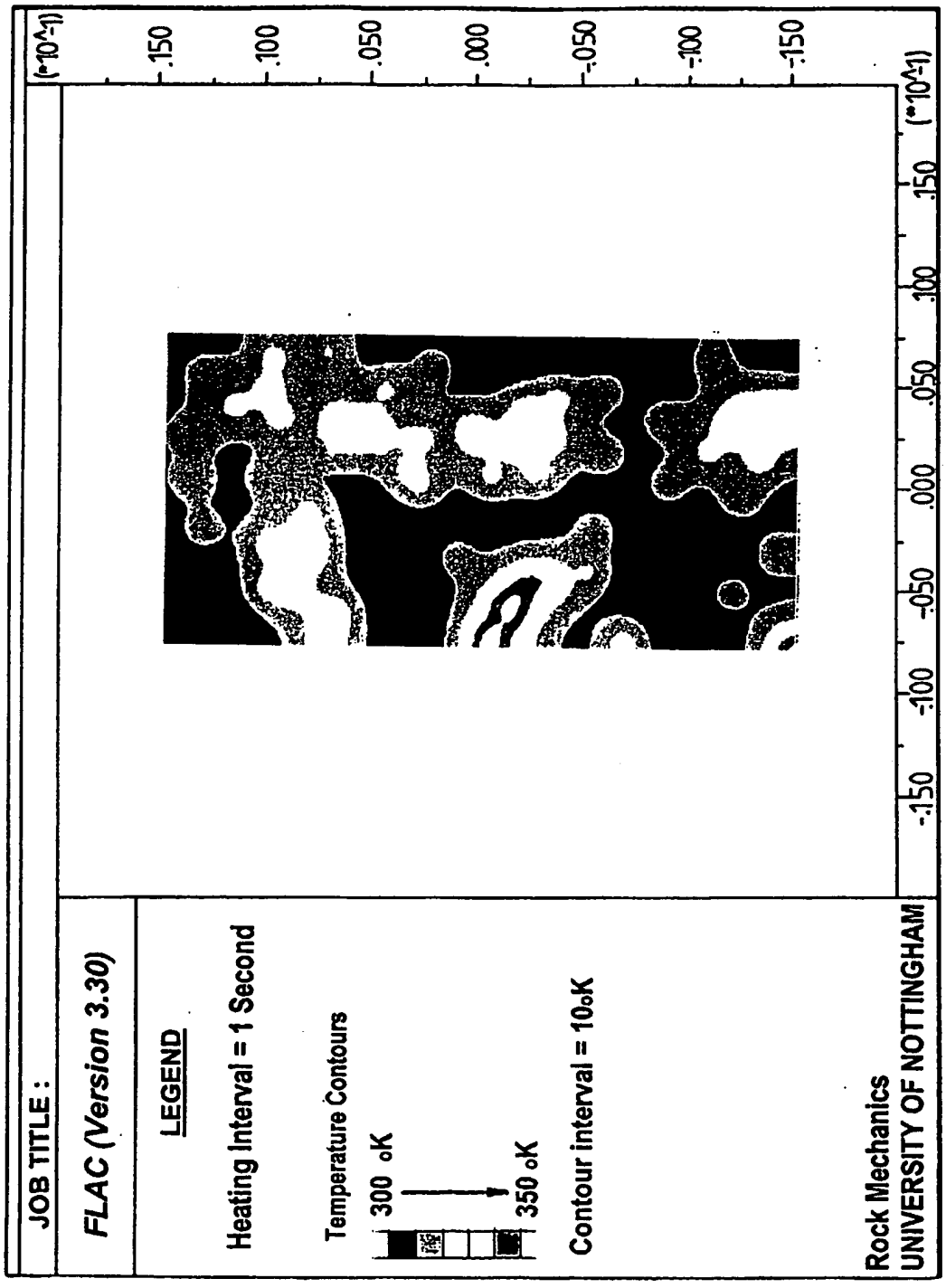
Direction of Simulated Loading During the Modelling of the Uniaxial Compression Test

Fig. 8



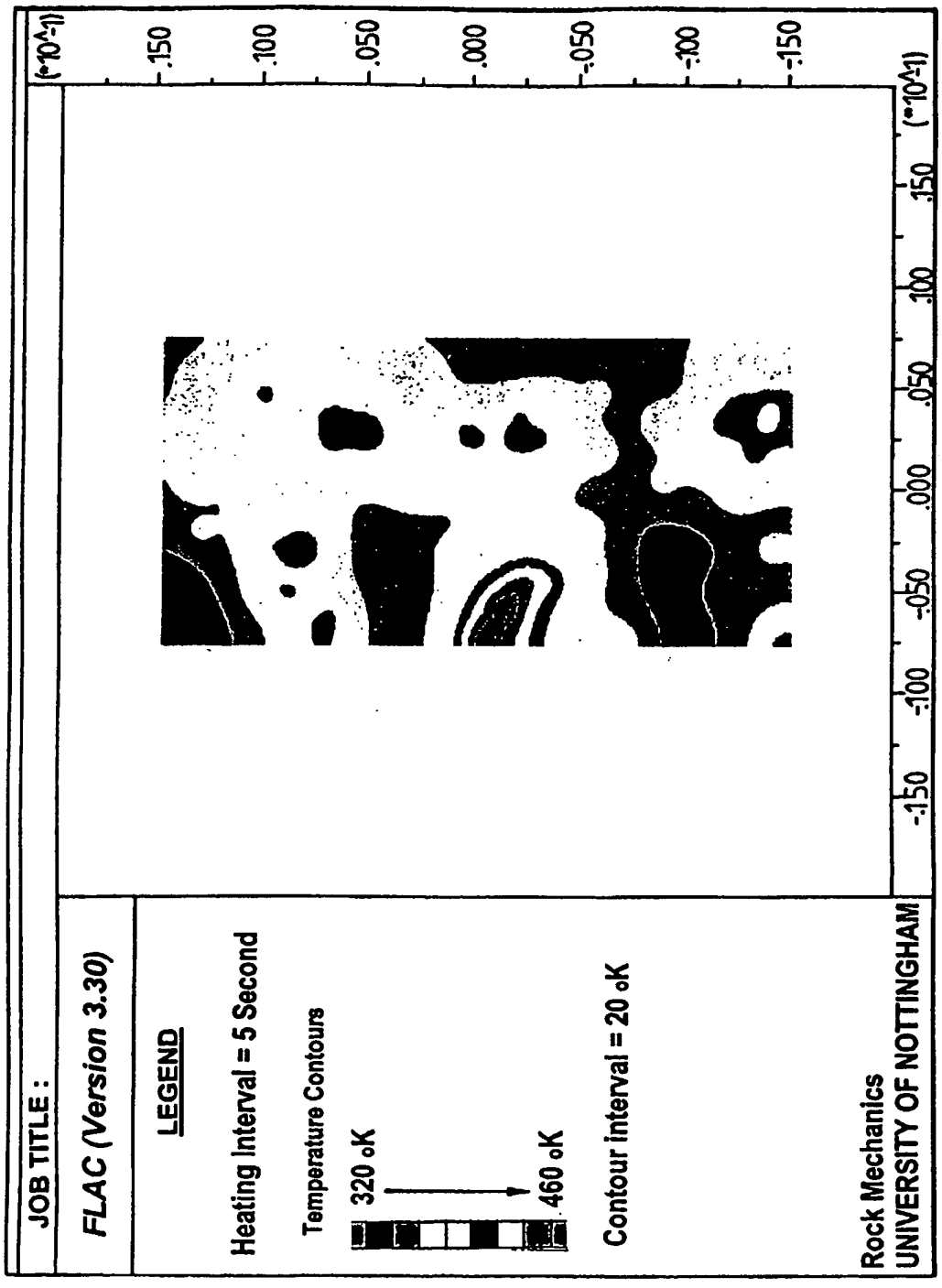
Affect of Microwave Heating time on the Predicted Unconfined Compressive Strength of the Theoretical Calcite and Pyrite Sample (2.6kW 2.45 GHz cavity, power density between $3x10^9 W/m^3$ and $9x10^9 W/m^3$)

Fig. 11



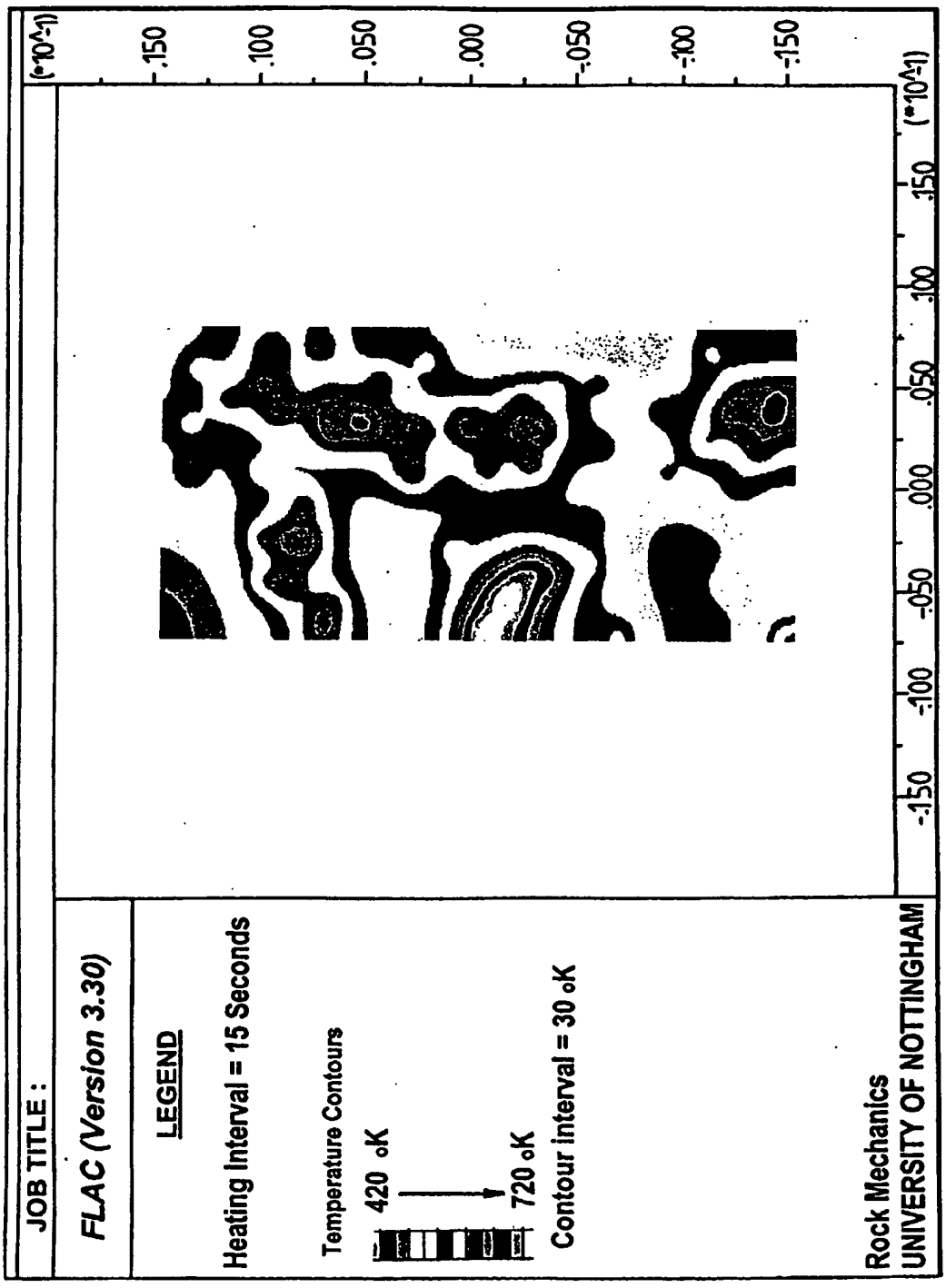
Modelled Temperature Distributions for a 2.45 GHz 2.6 kW Microwave Cavity (power density between $3 \times 10^9 W/m^3$ and $9 \times 10^9 W/m^3$) having a heating interval of 1 second

Fig. 9A



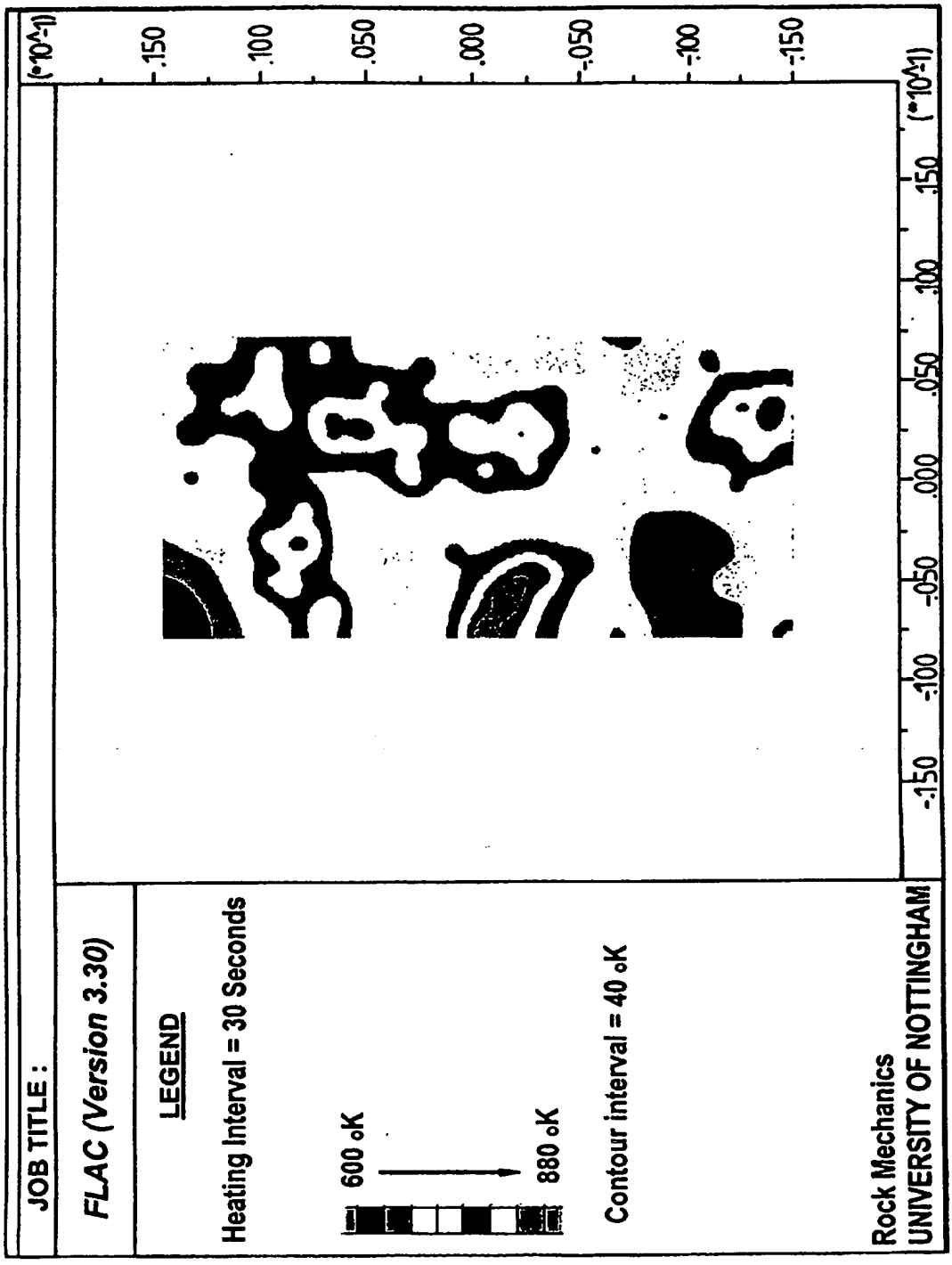
Modelled Temperature Distributions for a 2.45 GHz 2.6 kW Microwave Cavity (power density between 3×10^9W/m^3 and 9×10^9W/m^3) having a heating interval of 5 seconds

Fig. 9B



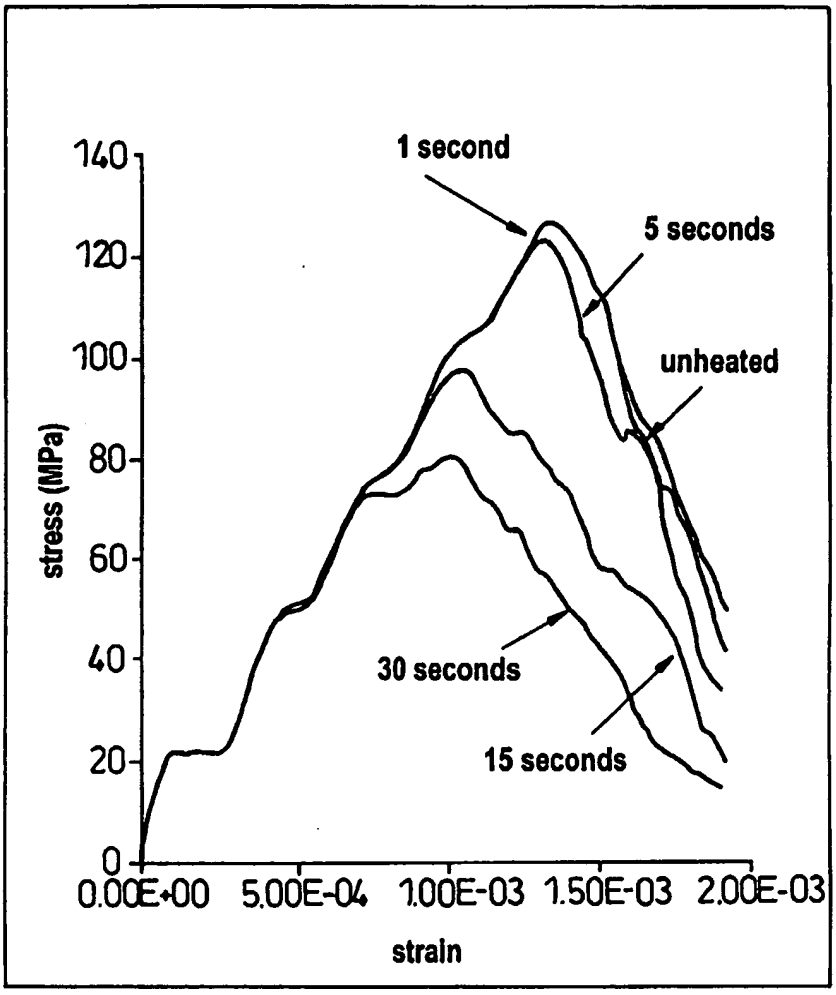
Modelled Temperature Distributions for a 2.45 GHz 2.6 kW Microwave Cavity (power density between 3×10^9W/m^3 and 8×10^9W/m^3) having a heating interval of 15 seconds

Fig. 9C



Modelled Temperature Distributions for a 2.45 GHz 2.6 kW Microwave Cavity (power density between 3×10^9 W/m^3 and 9×10^9 W/m^3) having a heating interval of 30 seconds

Fig. 9D



Affect of Varying Heating Times on the Numerically Modelled Stress-Strain Curves for the Theoretical Calcite and Pyrite Sample (Heated in a 2.6kW 2.45 GHz Microwave Cavity, power density between $3x10^9 W/m^3$ and $9x10^9 W/m^3$)

Fig. 10

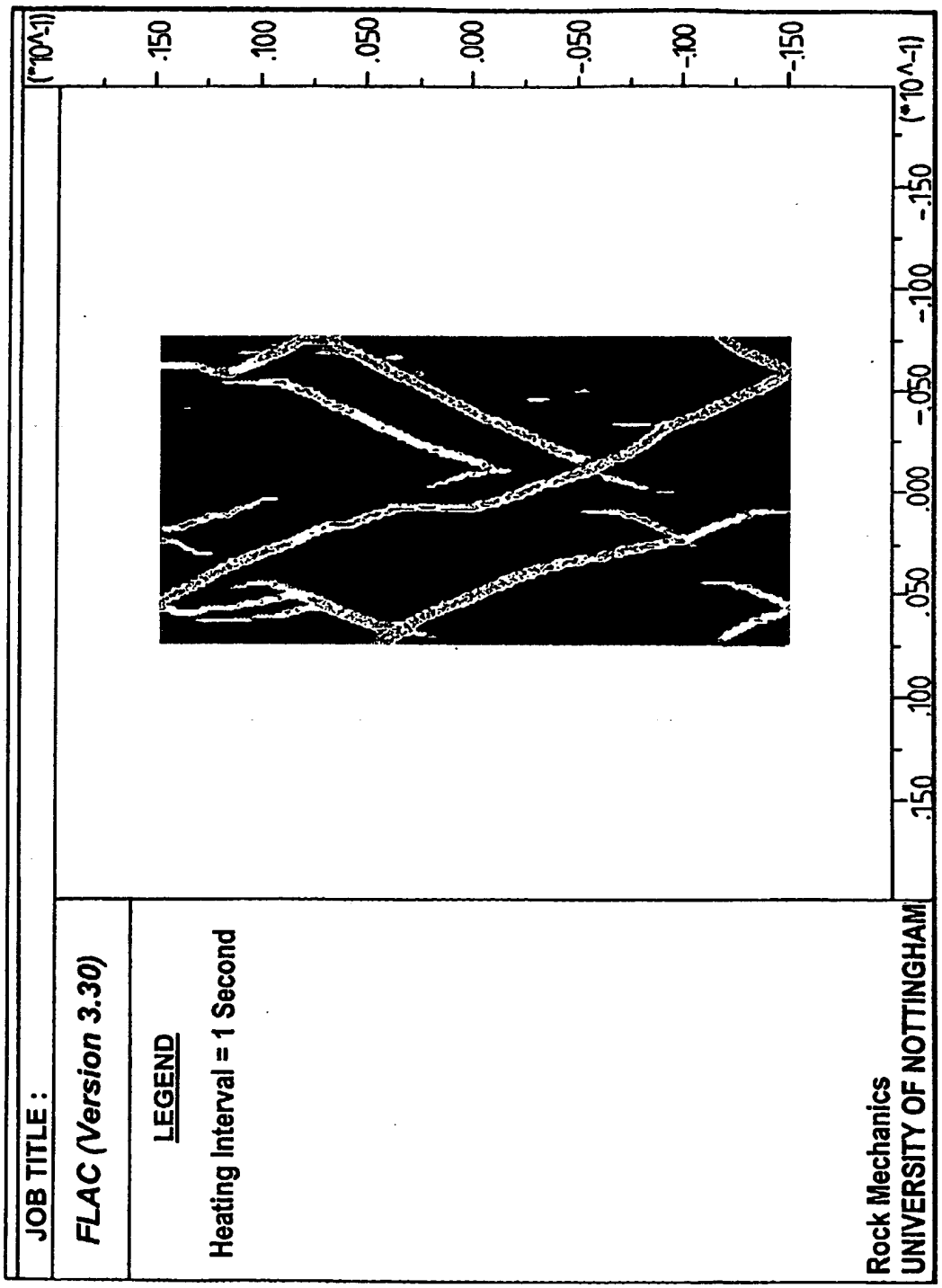


Fig. 12A

Shear Plane Development During Unconfined Compressive Tests for a 2.45 GHz 2.6 kW e Cavity PD between $3x10^9 W/m^3$ and $9x10^9 W/m^3$) having a heating interval of 1 second

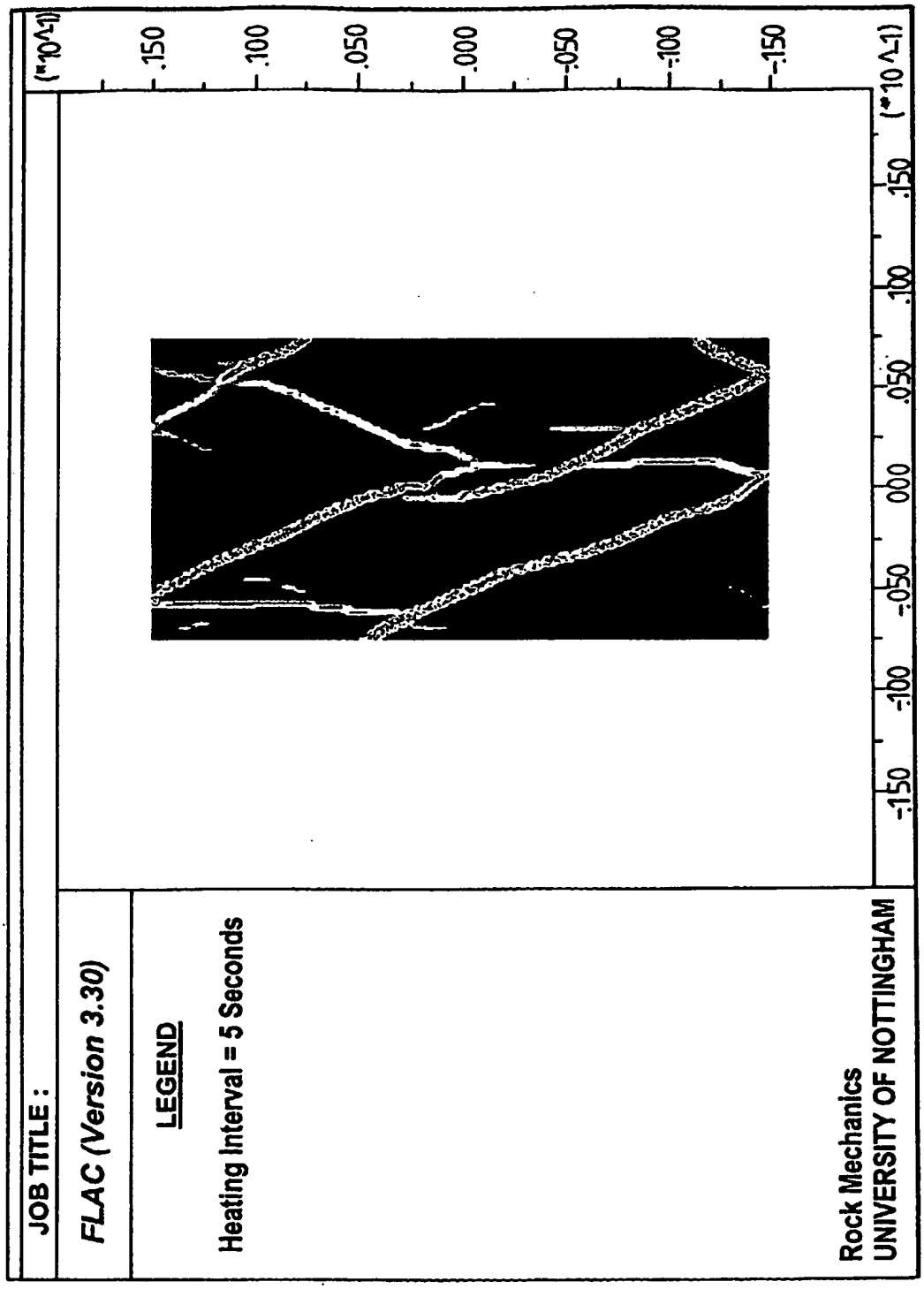


Fig. 12B

Shear Plane Development During Unconfined Compressive Tests for a 2.45 GHz 2.6 kW e Cavity PD between 3×10^9 W/m^3 and 9×10^9 W/m^3) having a heating interval of 5 second

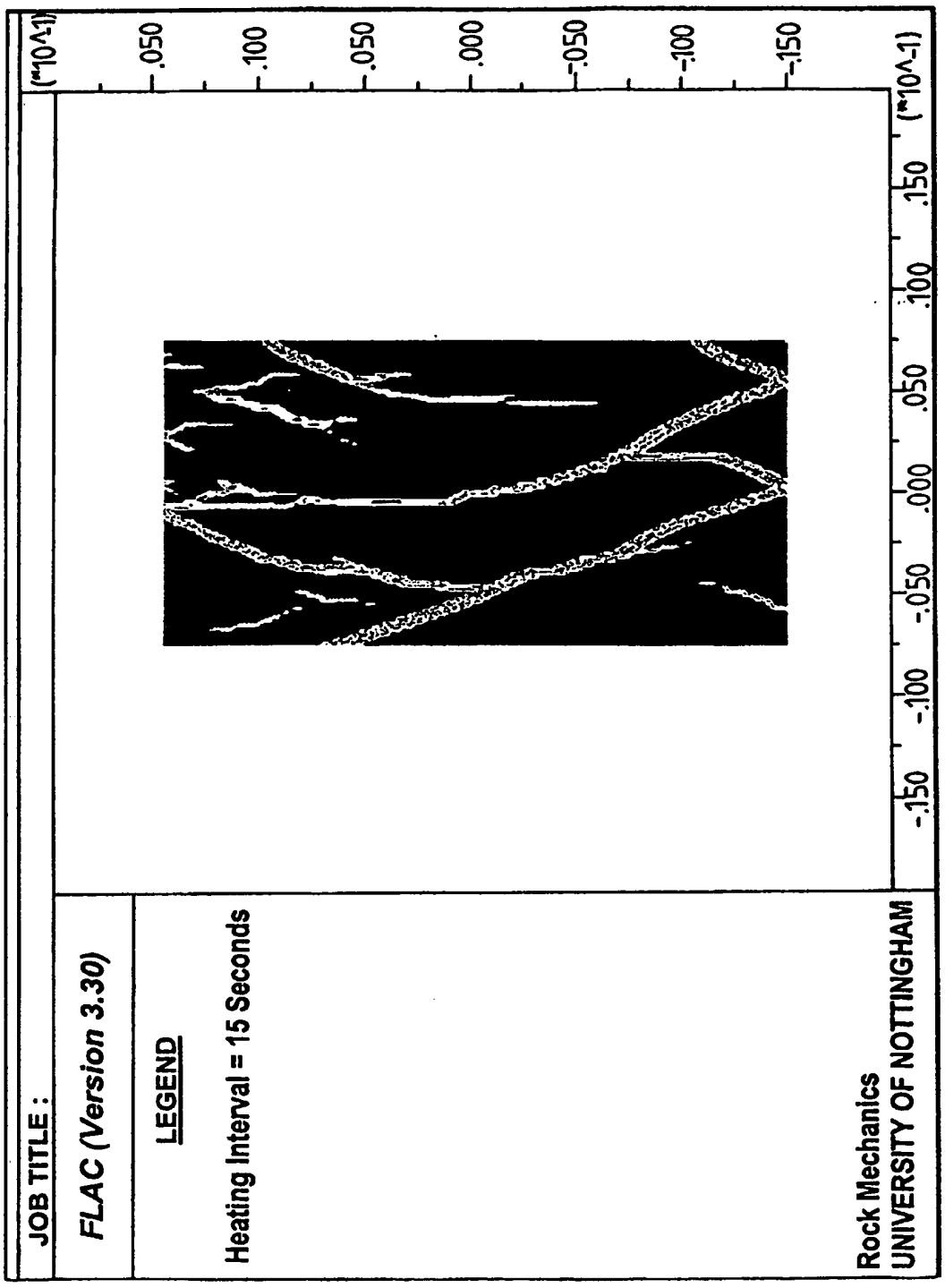
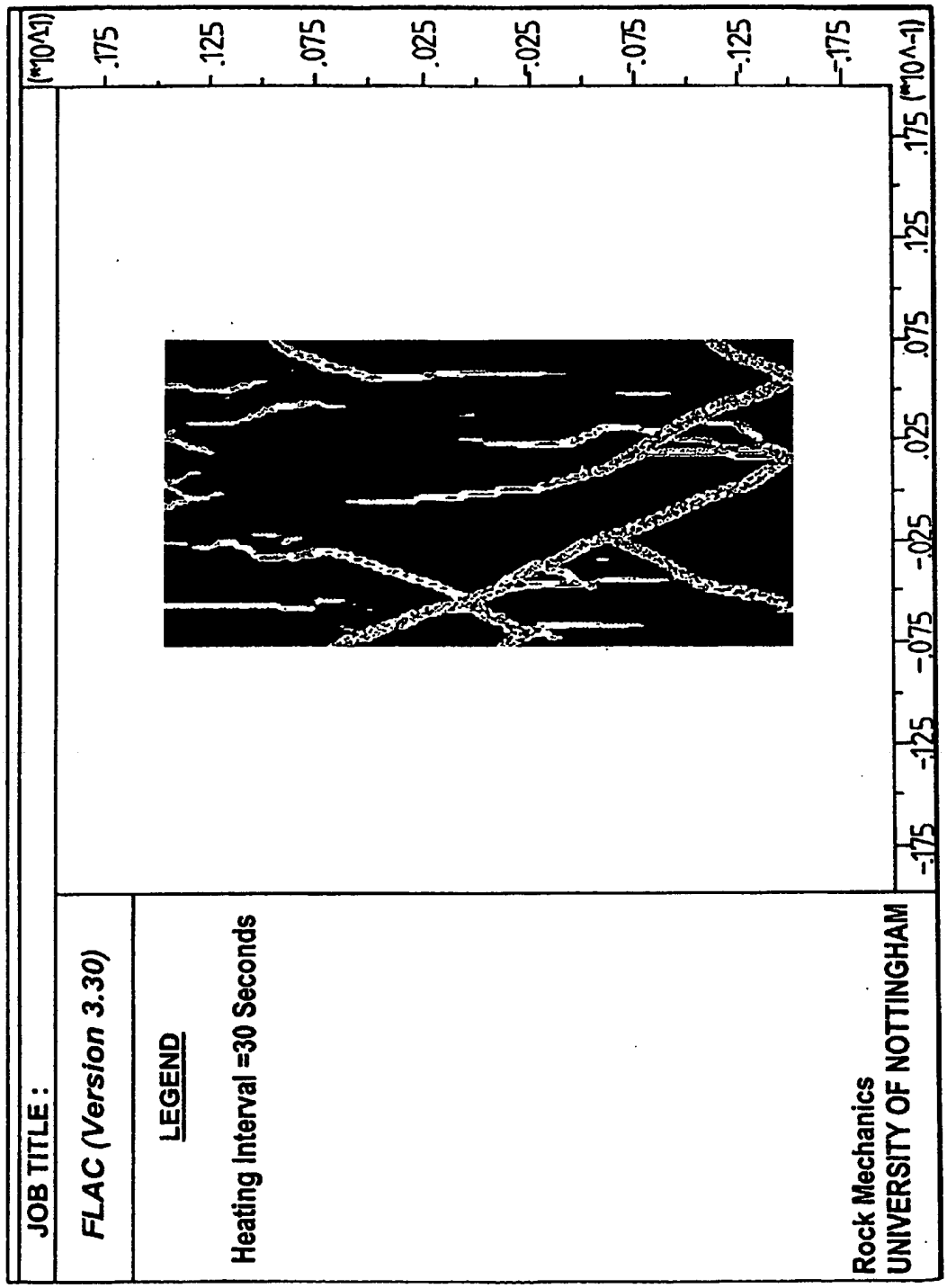


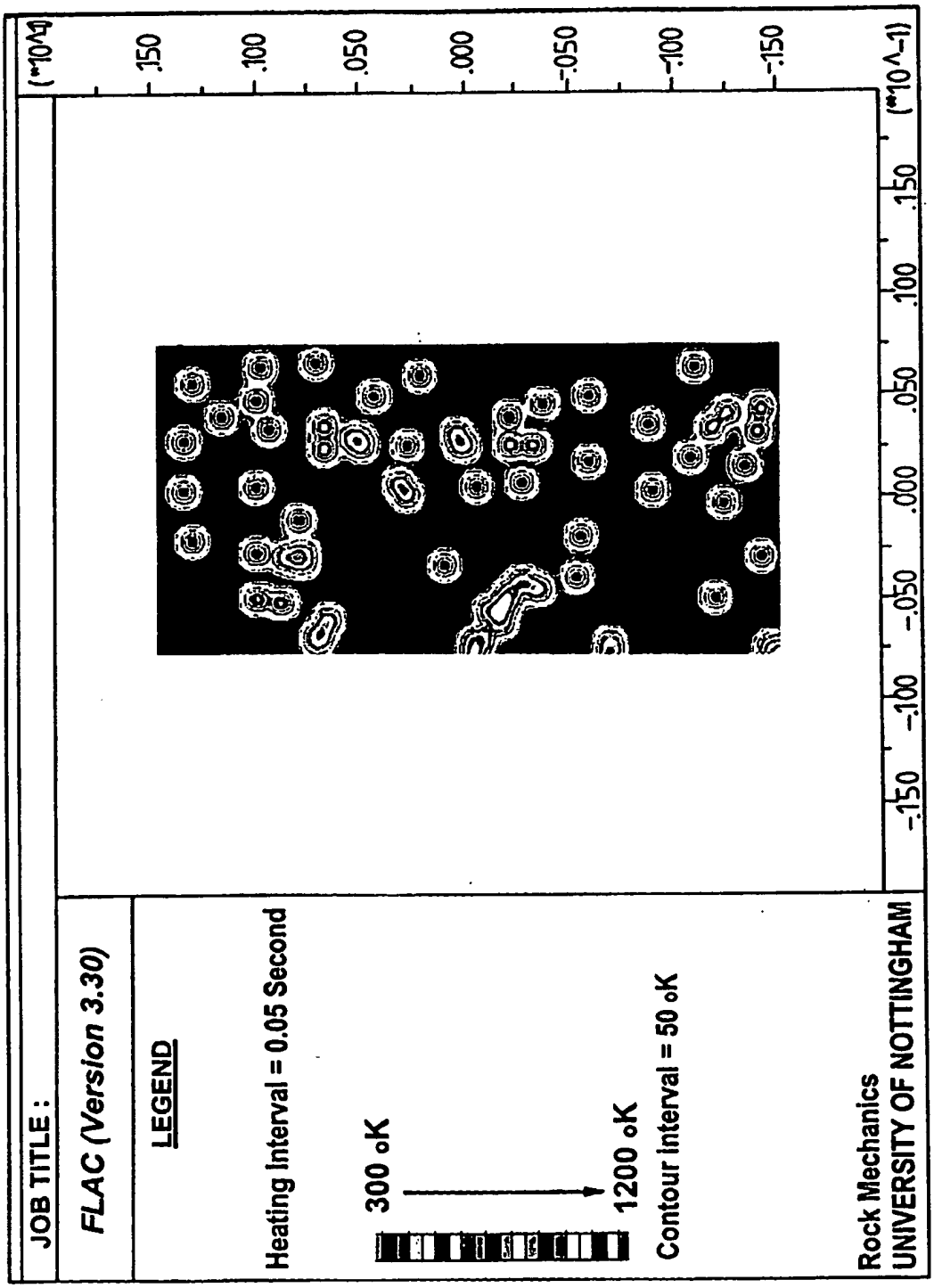
Fig. 12C

Shear Plane Development During Unconfined Compressive Tests for a 2.45 GHz 2.6 kW e Cavity PD between $3x10^9W/m^3$ and $9x10^9W/m^3$) having a heating interval of 15 second



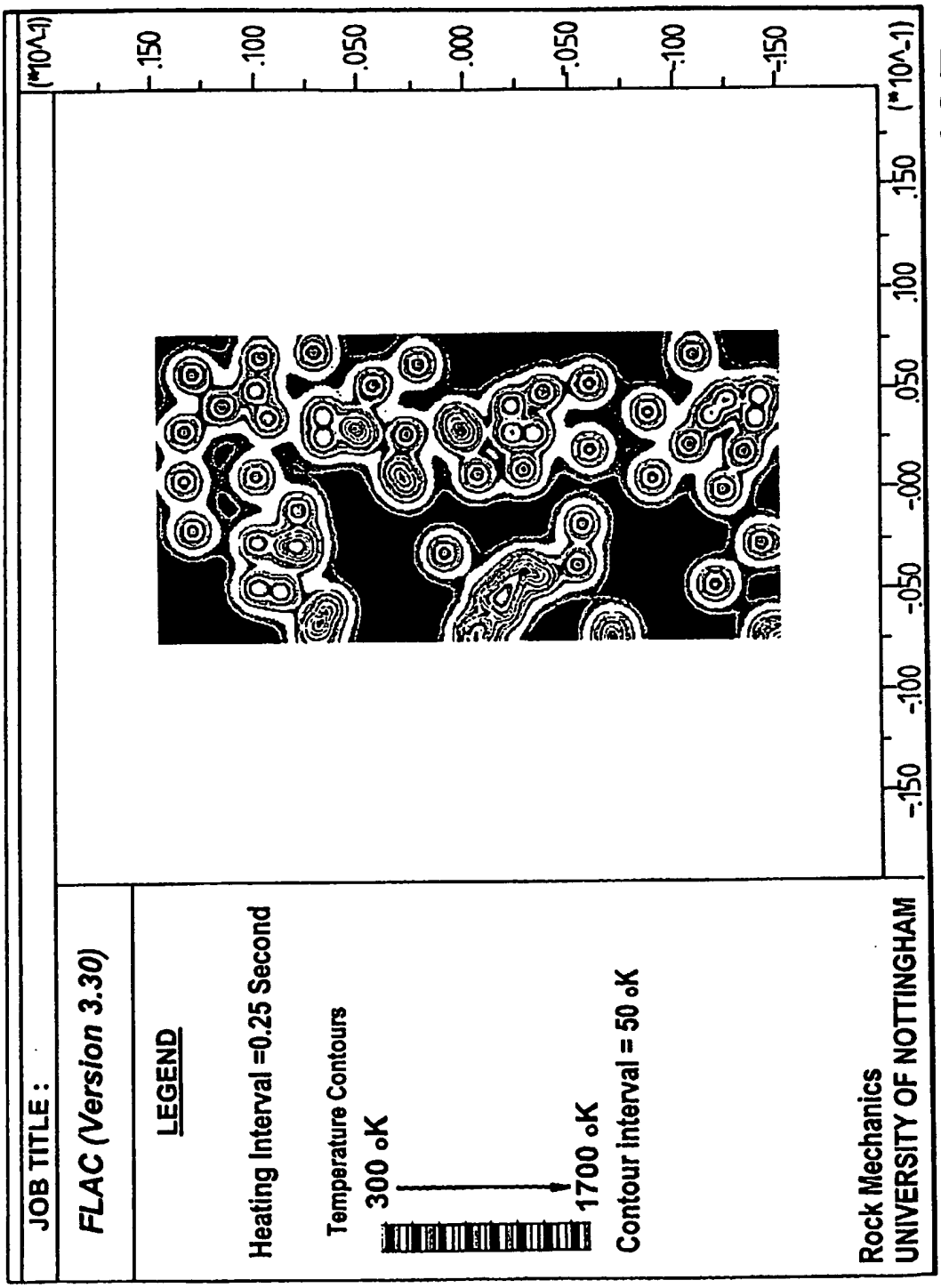
Shear Plane Development During Unconfined Compressive Tests for a 2.45 GHz 2.6 kW e Cavity PD between 3×10^9 W/m^3 and 9×10^9 W/m^3) having a heating interval of 30 second

Fig. 12D



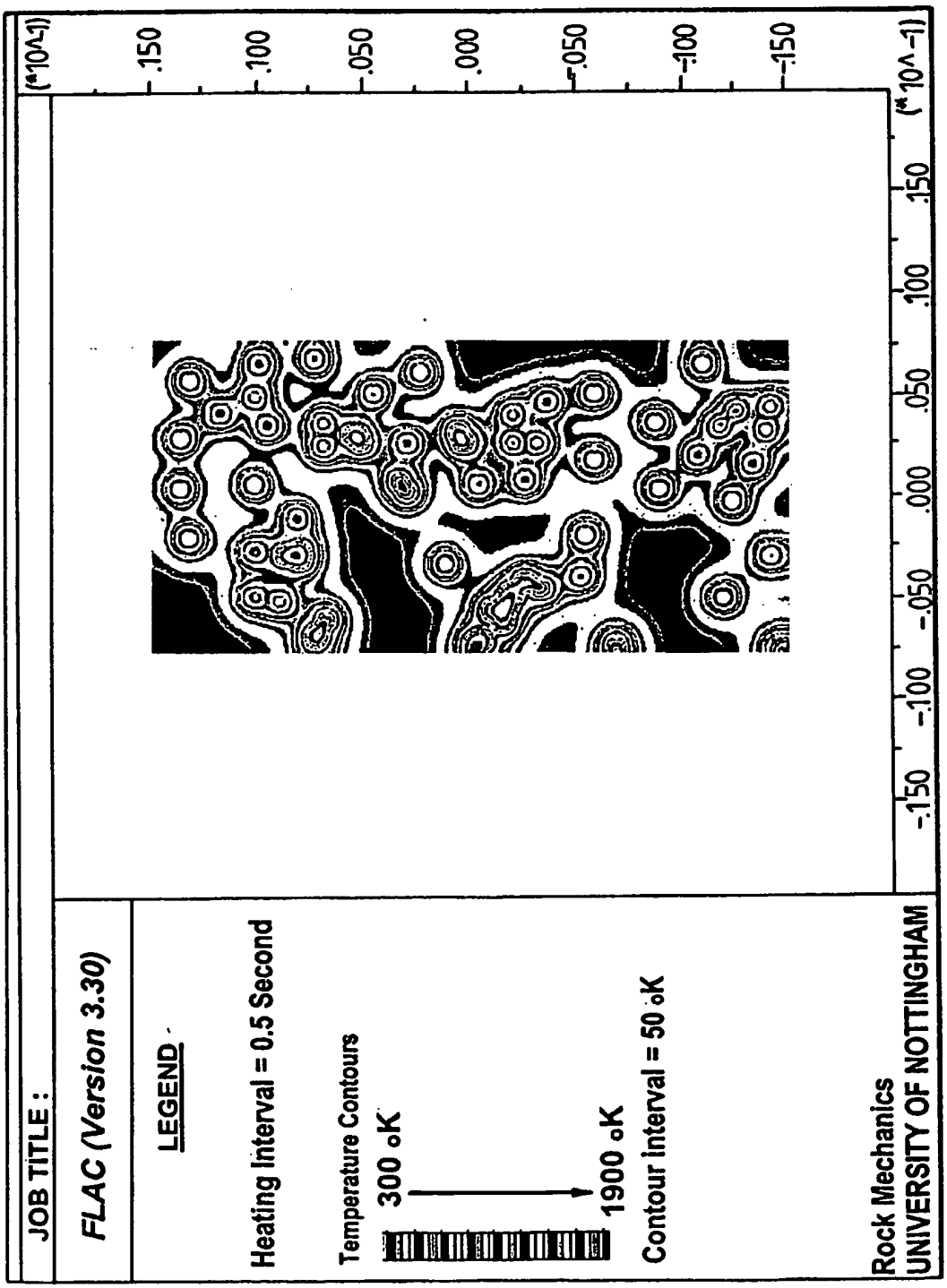
Modelled Temperature Distributions for a Microwave Cavity with a Power Density of 1×10^{11} watts/m^3 having a heating interval of 0.05 seconds

Fig. 13A



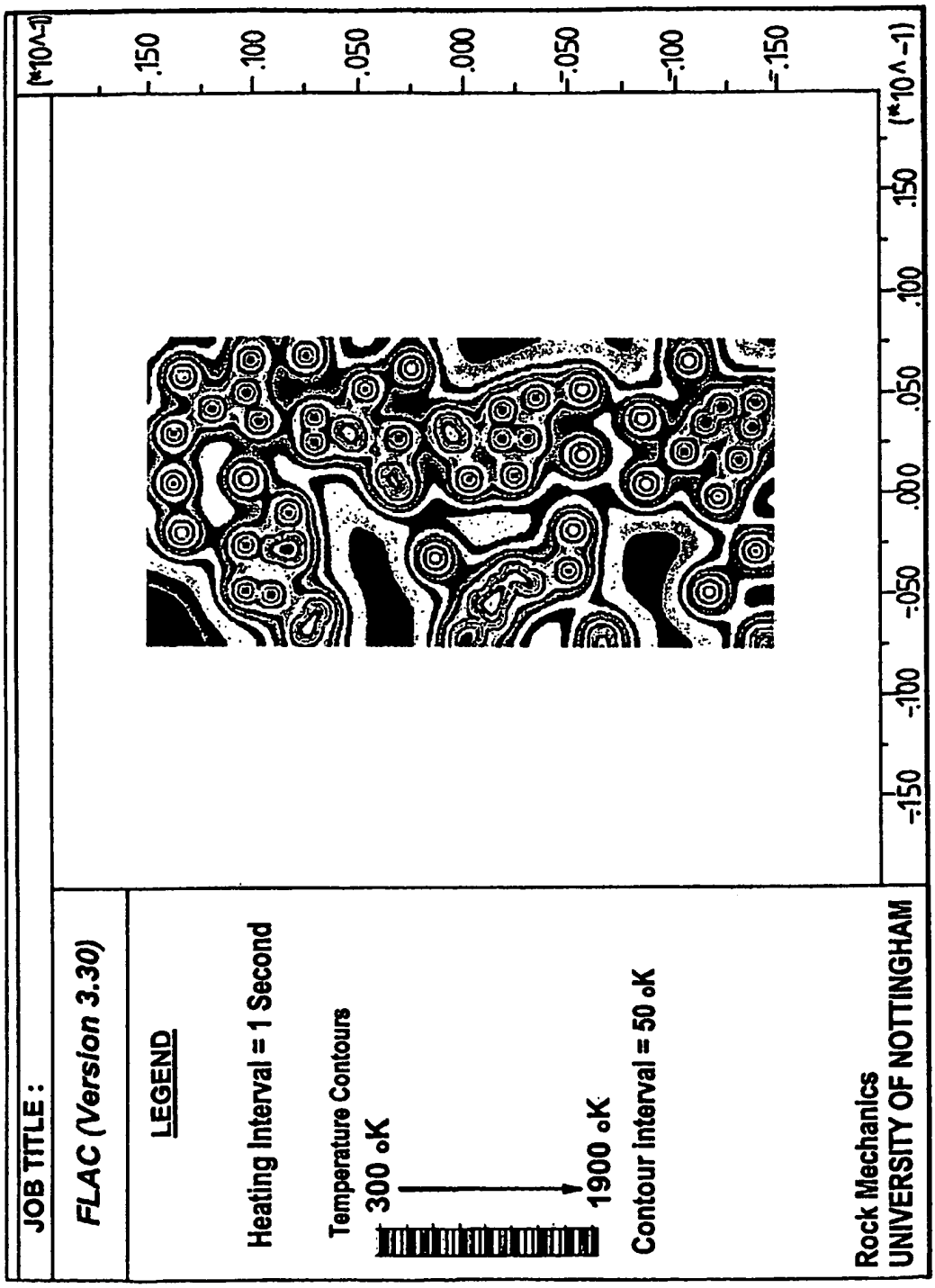
Modelled Temperature Distributions for a Microwave Cavity with a Power Density of 1×10^{11} watts/m^3 having a heating interval of 0.25 seconds

Fig. 13B



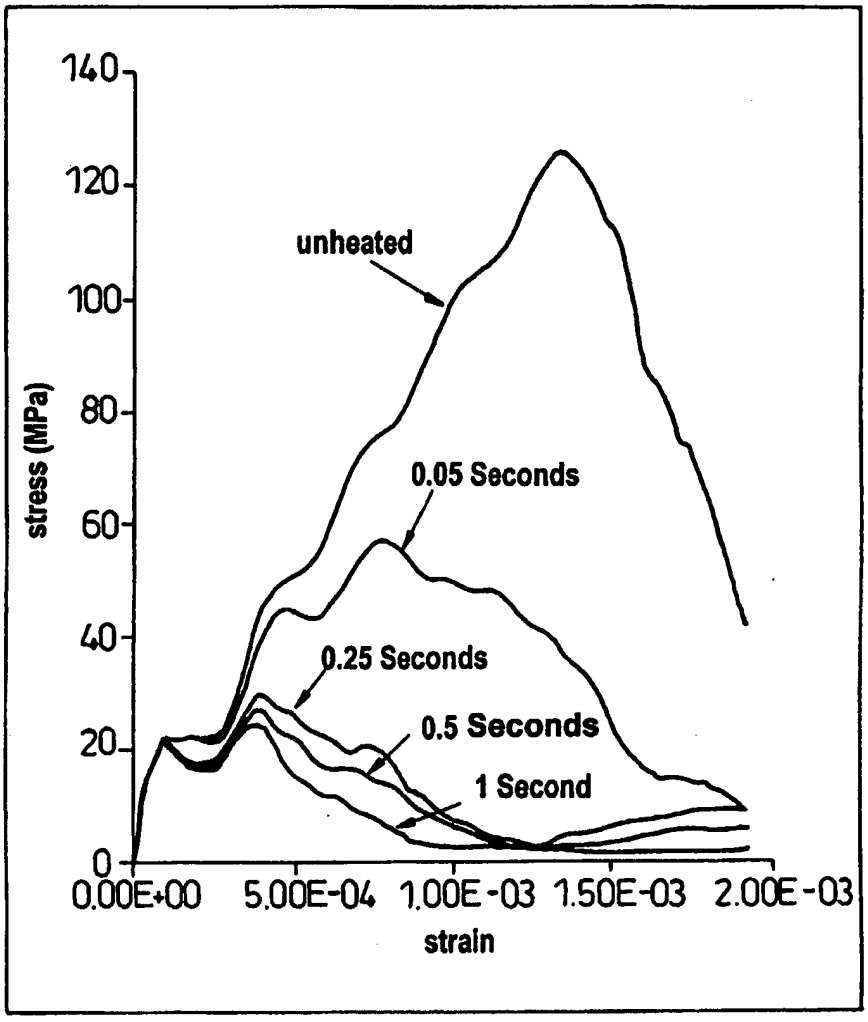
Modelled Temperature Distributions for a Microwave Cavity with a Power Density of $1x10^{11}$ watts/m^3 having a heating interval of 0.5 seconds

Fig. 13C



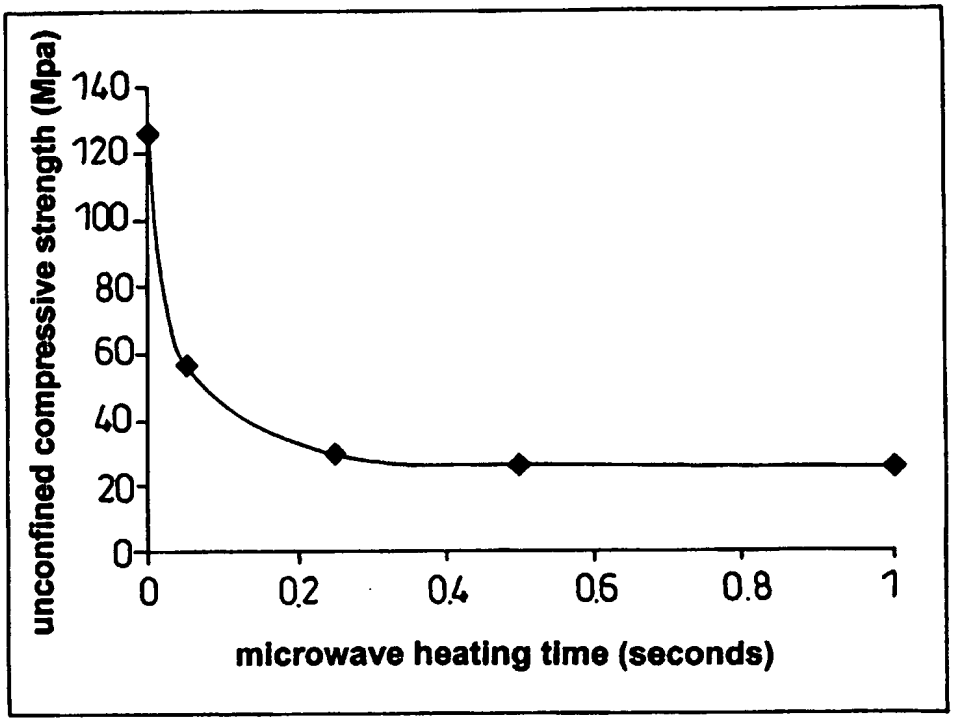
Modelled Temperature Distributions for a Microwave Cavity with a Power Density of 1×10^{11} watts/m^3 having a heating Interval of 1 second

Fig. 13D



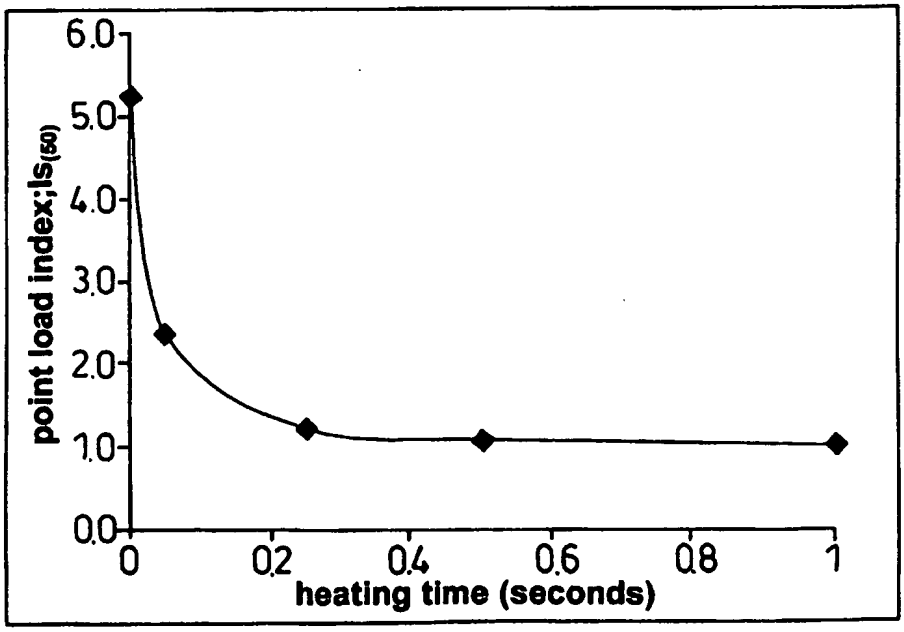
Affect of Varying Heating Times on the Numerically Modelled Stress-Strain Curves for the Theoretical Calcite and Pyrite Sample (Heated Microwave Cavity with a Power Density of $1x10^{11}$ watts/m^3)

Fig. 14



Affect of Microwave Heating Time on the Unconfined Compressive Strength of the Theoretical Calcite and Pyrite Sample (power density $1x10^{11}$ watt/m^3)

Fig. 15



Microwave Heating Time (Power Density = $1x10^{11}$watt/m^3) vs Point Load Index

Fig. 17

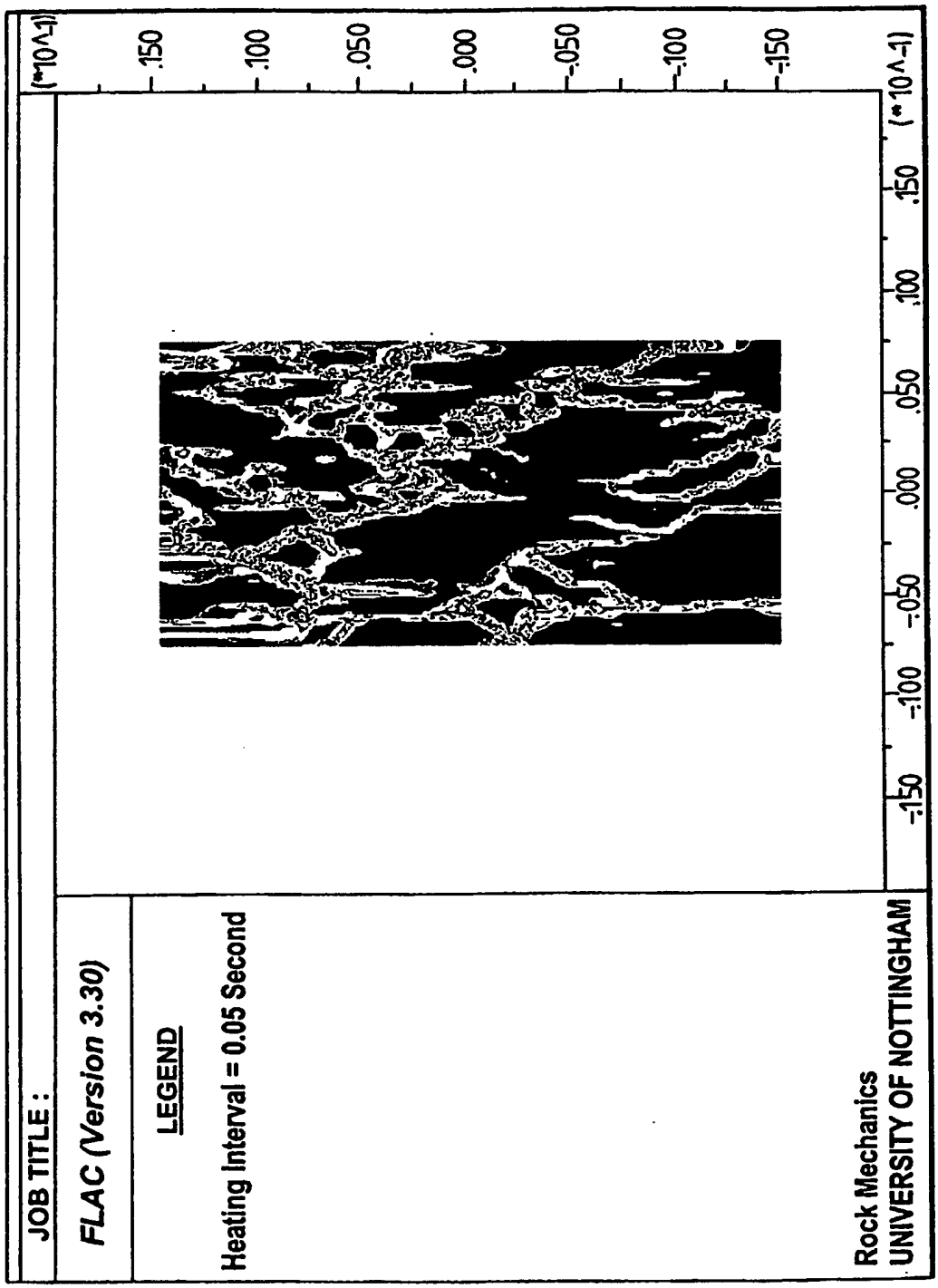
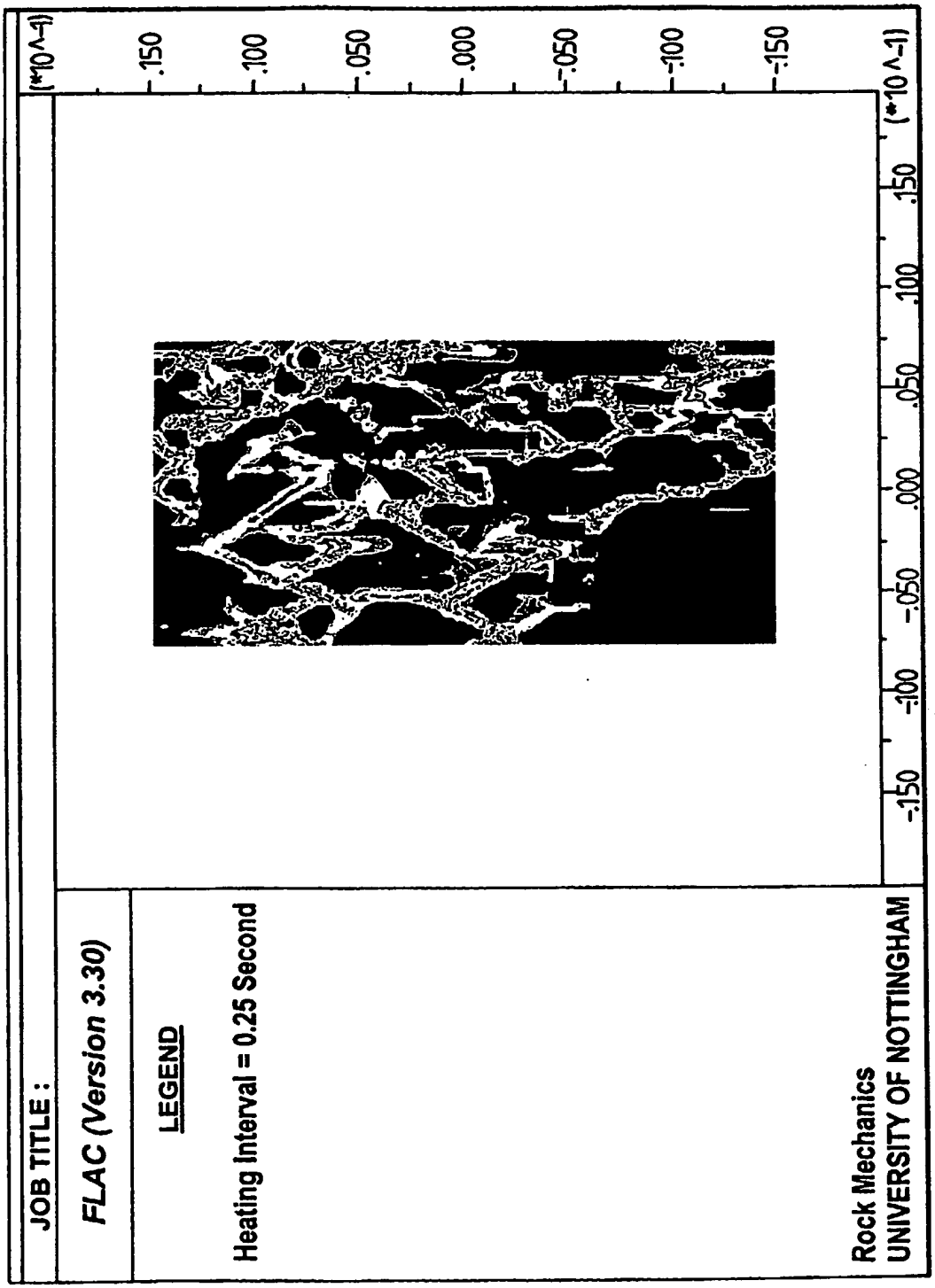


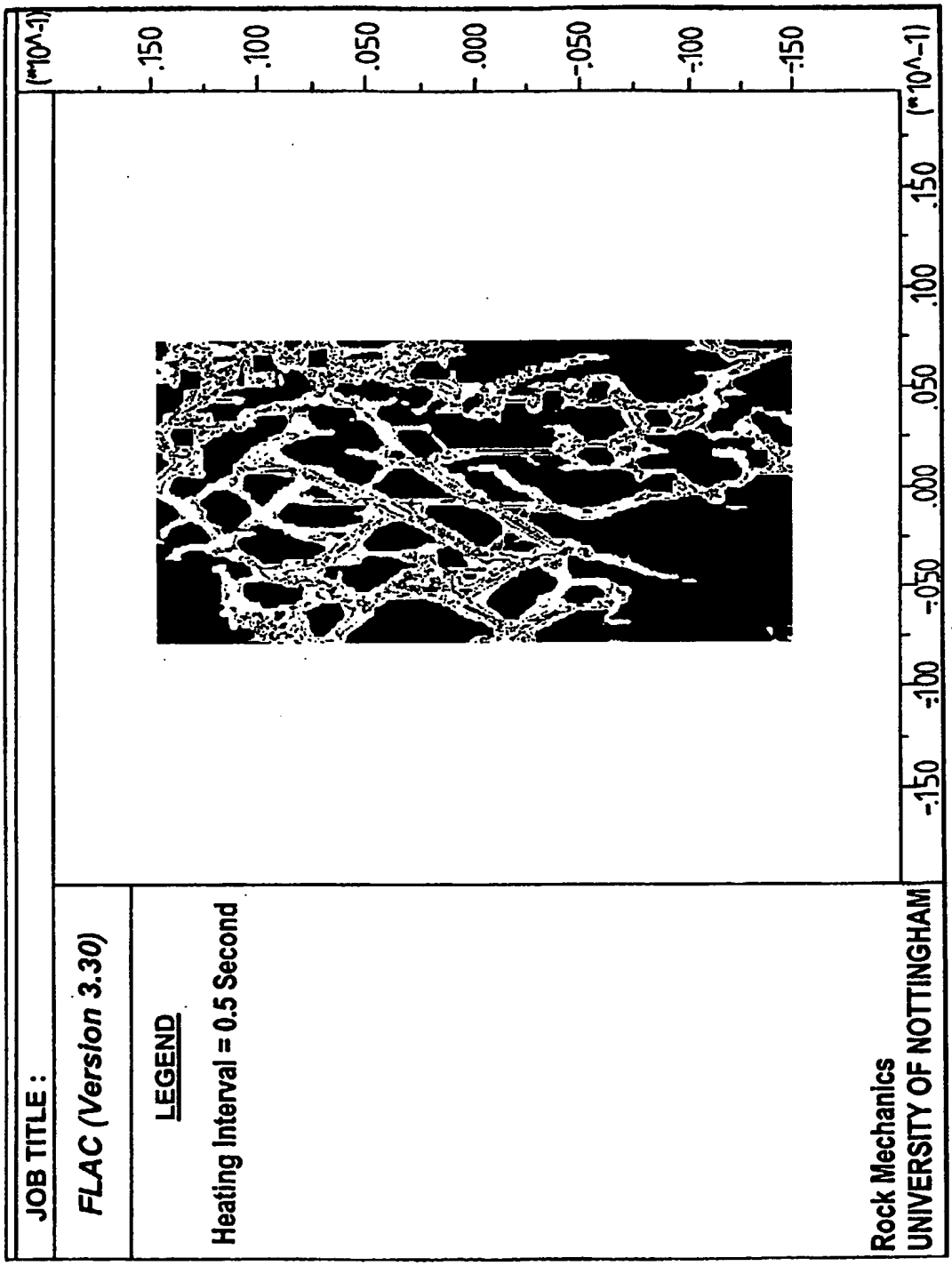
Fig. 16A

Modelled Shear Plane Development During Unconfined Compressive Tests for a Microwave Cavity with a Power Density of $1x10^{11}$ watts/m^3 having a heating interval of 0.05 seconds



Modelled Shear Plane Development During Unconfined Compressive Tests for a Microwave Cavity with a Power Density of 1×10^{11} watts/m^3 having a heating Interval of 0.25 seconds

Fig. 16B



Modelled Shear Plane Development During Unconfined Compressive Tests for a Microwave Cavity with a Power Density of $1x10^{11}$ watts/m^3 having a heating interval of 0.5 seconds

Fig. 16C

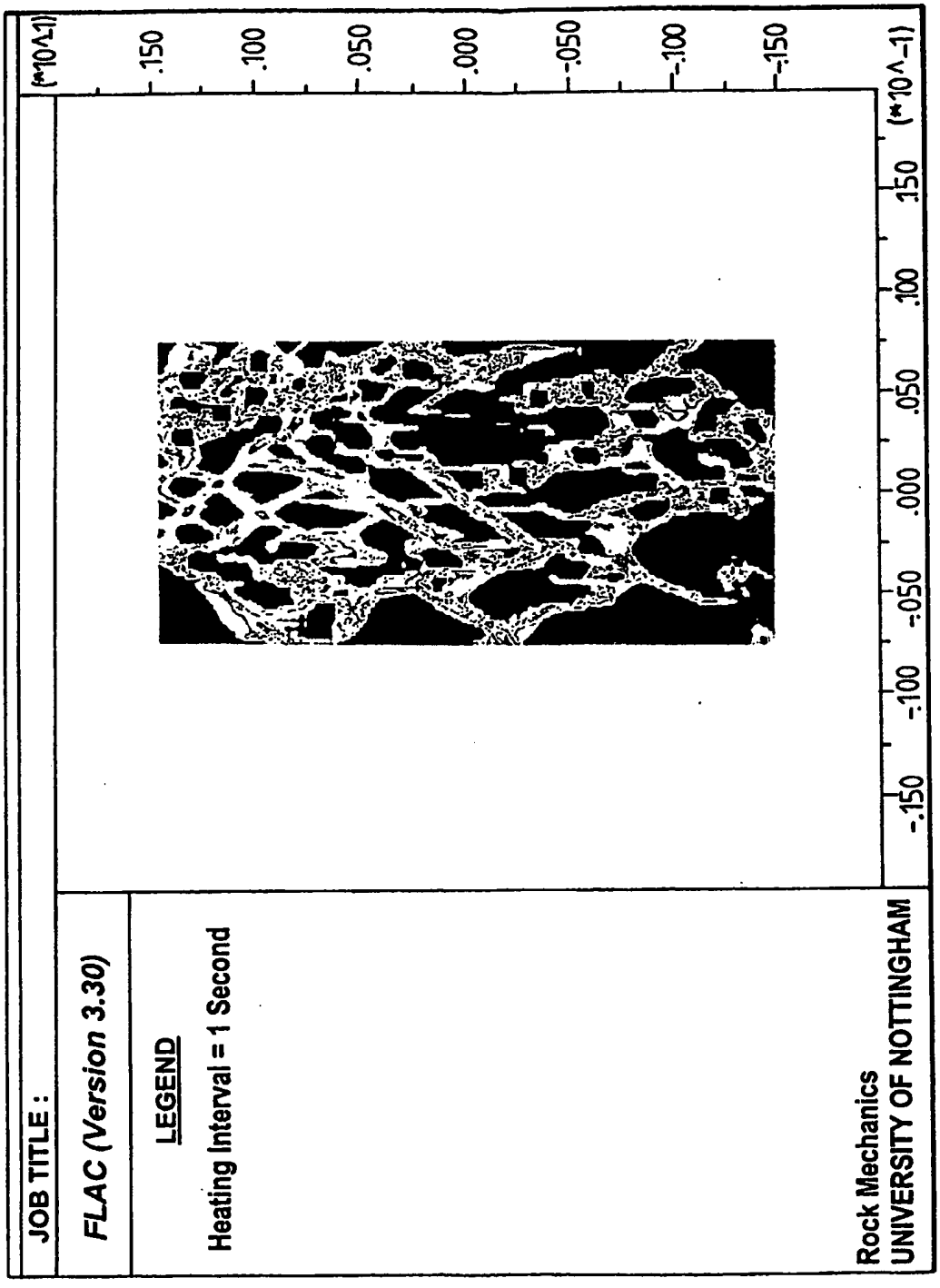
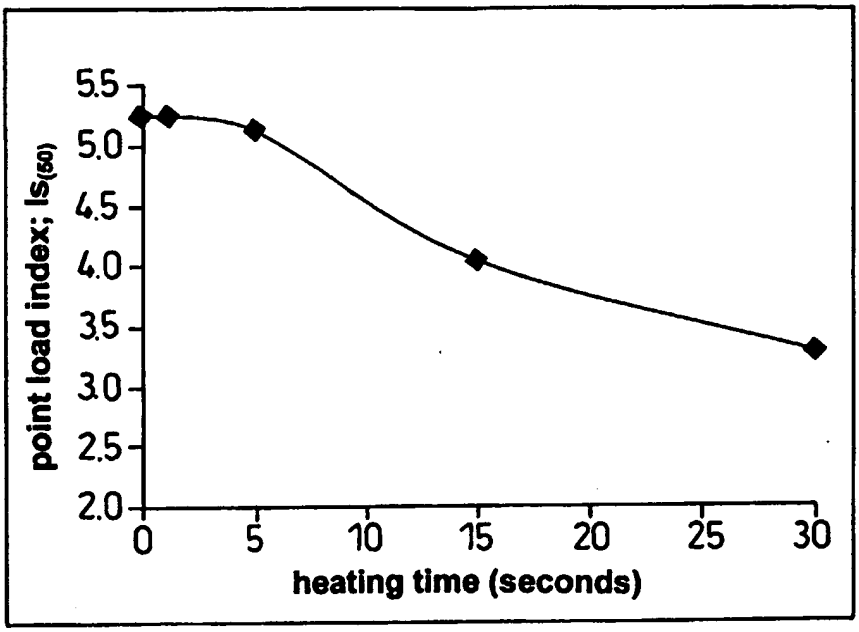


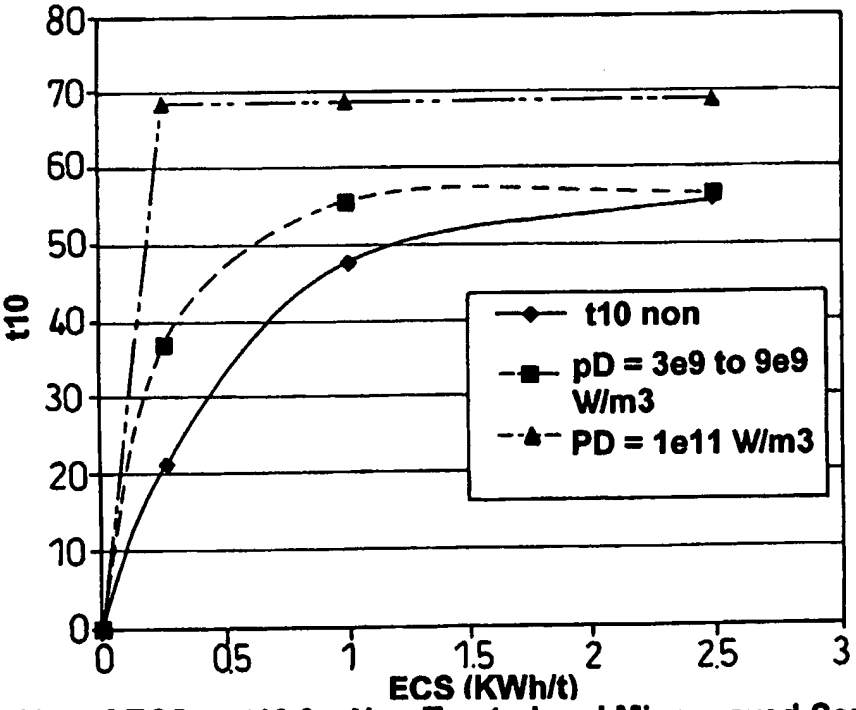
Fig. 16D

Modelled Shear Plane Development During Unconfined Compressive Tests for a Microwave Cavity with a Power Density of $1x10^{11}$ watts/m^3 having a heating interval of 1 second



Microwave Heating Time (2.6kW 2.45 GHz power density between $3x10^9 W/m^3$ and $9x10^9 W/m^3$) vs Point Load Index

Fig. 18



Plot of ECS vs t10 for Non-Treated and Microwaved Samples

Fig. 19

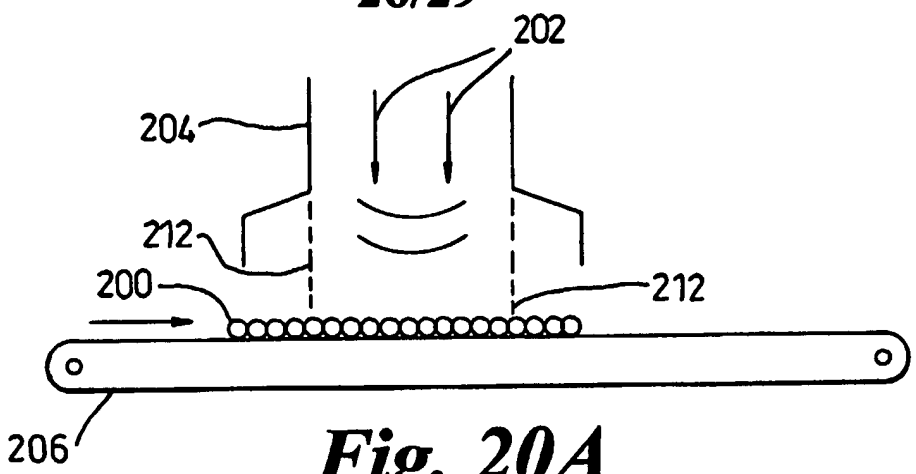


Fig. 20A

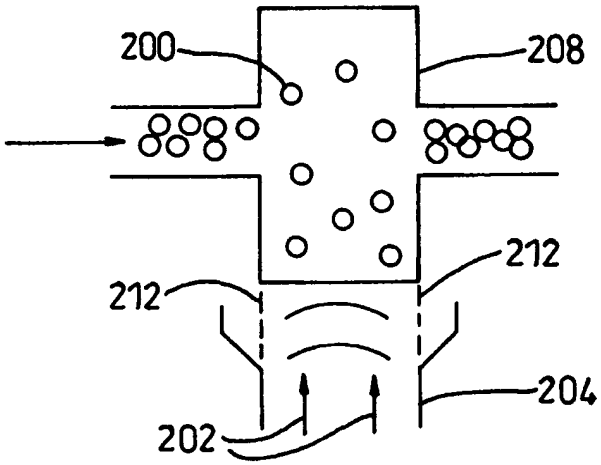


Fig. 20B

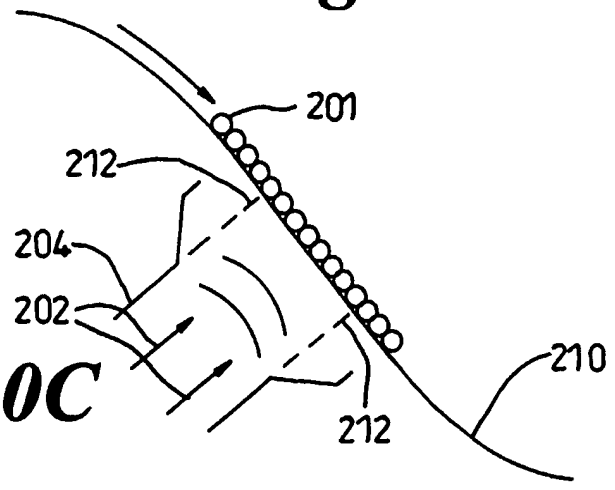


Fig. 20C

Mineral	Specific heat capacity (J/Kg°K)		
	298°K	500°K	1000°K
Calcite	819	1051	1238
Pyrite	517	600	684

Table 1 Specific Heat Capacity as a Function of Temperature

Mineral	Thermal conductivity (W/m°K)		
	273°K	373°K	500°K
Calcite	4.02	3.01	2.55
Pyrite	37.90	20.50	17.00

Table 2 Thermal Conductivity as a Function of Temperature

Mineral	Thermal expansion coefficient (1/°K)			
	373°K	473°K	673°K	873°K
Calcite	13.1×10^{-6}	15.8×10^{-6}	20.1×10^{-6}	24.0×10^{-6}
Pyrite	27.3×10^{-6}	29.3×10^{-6}	33.9×10^{-6}	—

Table 3 Thermal Expansion Coefficient as a Function of Temperature

Mineral	density Kg/m³	Young's Modulus Gpa	Poisson's Ratio	Peak Strength			Residual Strength (after 1% strain)		
				ϕ°	cMPa	TMPa	ϕ_r °	c_rMPa	T_rMpa
Pyrite	5018	292	0.16	54	25	15	54	0.1	0
Calcite	2680	797	0.32	54	25	15	54	0.1	0

Table 4 Mechanical Properties of the Minerals

Heating time (seconds)	Maximum temperature (°K)	Minimum temperature (°K)	Unconfined compressive strength (MPa)
0	300	300	126
1	350	300	126
5	460	320	123
15	700	400	97
30	900	600	79

Table 5 Modelled Temperatures and Unconfined Compressive Strengths for Various Microwave Heating Times (2.6kW 2.45Ghz, Microwave Cavity power density between $3x10^9 W/m^3$ and $9x10^9 W/m^3$

Heating time (seconds)	Maximum temperature (°K)	Minimum temperature (°K)	Unconfined compressive strength (MPa)
0	300	300	126
0.05	1200	300	57
0.25	1700	300	29
0.5	1900	300	26
1	1900	300	25

Table 6 Modelled Temperatures and Unconfined Compressive Strengths for Various Microwave Heating Times (Microwave Cavity with a Power Density of $1x10^{11}$ watt/m^3).

time(secs)	Is(50)	Kic	b	A.b	A
0	5.25	1.097	1.91	107.61	56.03
10	4.45	093	2.54	145.16	57.14
30	3.4	0.7106	4.22	238.56	56.63

Table 7 Breakage Parameters for 2.6kW Multimode Cavity Microwave Treatment (power density between $3x10^9 W/m^3$ and $9x10^9 W/m^3$)

time	Is(50)	Kic	b	A.b	A
0	5.25	1.097	1.91	107.01	56.03
0.1	1.8	0.376	11.83	772.67	65.31
0.2	1.25	0.2615	21.96	1513.41	68.91

Table 8 Breakage Parameters for 15kW, 2.45GHz (Power density $1x10^{11}$ W/m^3 Single Mode Microwave Cavity Treated Ore